

WHAT IS CLAIMED IS:

1. A voltage controlled oscillator (VCO) device, suitable for use in a frequency shift keying (FSK) system, the VCO device comprising:

a switching varactor unit, having a first terminal and a second terminal, wherein
5 the switching varactor unit produces a capacitance, according to a frequency-selection voltage; and

a VCO core, having a first output terminal, a second output terminal complementary to the first output terminal, and an input terminal, wherein the switching varactor unit is coupled in parallel with the VCO core at the first output terminal and the
10 second output terminal to produce a capacitance effect with respect to the capacitance, so as to adjust a frequency constant \sqrt{LC} of the VCO core.

2. The VCO device of claim 1, wherein the switching varactor unit comprises a switching diode unit for receiving a mode selection signal with at least one bit data, wherein the switching diode unit includes:

15 a plurality of diode pairs coupled in parallel, wherein the diode pairs can be switched on with respect to a quantity of the mode selection signal, so as to produce the capacitance, wherein the diode pair has one common terminal coupled to the frequency-selection voltage and another terminals coupled to the first terminal and the second terminal, respectively.

20 3. A frequency shift keying (FSK) system, comprising:

a frequency selection unit, for receiving an input signal and a mode selection signal, and exporting a frequency-selection voltage according to the mode selection signal;

a switching varactor unit, having a first terminal and a second terminal, wherein the switching varactor unit produces a capacitance, according to a frequency-selection voltage; and

a VCO core, having a first output terminal, a second output terminal complementary to the first output terminal, and an input terminal, wherein the switching varactor unit is coupled in parallel with the VCO core at the first output terminal and the second output terminal to produce a capacitance effect with respect to the capacitance, so as to adjust a frequency constant \sqrt{LC} of the VCO core;

a first VCO buffer, coupled to the first output terminal of the VCO core and exporting a desired frequency;

a second VCO buffer, coupled to the second output terminal of the VCO core; and

a phase locked loop unit, coupled between an output of the second VCO buffer and the input terminal of the VCO core to form a feedback loop and produce the desired frequency.

4. The FSK system of claim 1, wherein the switching varactor unit comprises a switching diode unit for receiving the mode selection signal, wherein the switching diode unit includes:

a plurality of diode pairs coupled in parallel, wherein the diode pairs can be switched on with respect to a quantity of the mode selection signal, so as to produce the capacitance, wherein diodes of each diode pair have a common terminal coupled to the frequency-selection voltage and another terminals coupled to the first terminal and the second terminal, respectively.

5. The FSK system of claim 4, wherein the diode pairs comprise bipolar junction varactor diode or metal-oxide semiconductor (MOS) varactor diode.

6. The FSK system of claim 4, wherein each diode of the diode pairs also coupled with a switching device controlled by the mode selection signal.

5 7. The FSK system of claim 6, wherein the switching varactor unit further comprises a decoder to decode the mode selection signal into a plurality of channels with respect to the diode pairs for use in control the switching device.

8. A method to adjust an operation frequency of a voltage controlled oscillator (VCO) core, comprising

10 providing a voltage controlled oscillator (VCO) core, having an output terminal, a feedback output terminal complementary to the output terminal, and an input terminal, wherein the feedback output terminal and the input terminal form a feedback loop through a phase locked loop unit;

15 providing a switching varactor unit, for producing a capacitance with respect to a mode selection signal; and

 coupling the switching varactor unit with the VCO core in parallel, so as to shift a frequency constant \sqrt{LC} of the VCO core.

9. The method of claim 8, wherein the mode selection signal in the switching varactor unit is decoded and turns on corresponding varactor channels of the switching
20 varactor unit, so as to change the capacitance.